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New in the Vestibular Rehabilitation of Patients with Dizziness

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Abstract.Vestibular rehabilitation is a simple and effective method of treatment of patients with diseases of peripheral and central parts of vestibular analyzer. The diagnosis of vestibular disorders, estimation of severance and dynamics of patient's state is conducted with use of clinical tests with high level of significance. Among such tests there are investigation of spontaneous and end-position nistagmus, Halmagy test, test "to stand up and go for time", test "on one leg equilibration" and so on. Vestibular gymnastic is composed of exercises for visual stabilization and balance training. The results of observation research the purpose of which was to estimate the optimal duration of vestibular rehabilitation in patients with unilateral no progressive peripheral vestibular disorder are presented. The optimal duration of treatment was established to be as little as two months.

Keywords:*dizziness; vestibular disorders; vestibular rehabilitation.*

IntroductionVestibular rehabilitation is a relatively simple and effective method of treating vestibular diseases caused by damage to the vestibular system at the peripheral level. Injuries to the vestibular system are common in clinical practice. Thus, according to a recent study conducted in the United States, the prevalence of obvious and hidden vestibular disorders in people over 40 years of age reaches 35.4% [1]. According to another study, up to 4% of adults experience chronic balance disorder [2].

The vestibular system performs two main functions: it ensures the stability of the image on the retina, so that objects remain stationary when moving the head, and participates in maintaining balance. Consequently, diseases of the vestibular system are manifested by dizziness (i.e., a feeling of imaginary movement or rotation of objects around the patient or the patient himself in space) and instability. Vestibular disorders, both acute and chronic, significantly limit the daily activity of patients [3,4].

Indications for vestibular rehabilitation are non-progressive peripheral vestibular disorders, diseases with damage to the peripheral parts of the vestibular analyzer. Vestibular rehabilitation is most effective in cases of non-progressive unilateral peripheral vestibular disorder due to vestibular neuritis or labyrinthitis [6,7]. The study of the vestibular system includes the study of spontaneous and installation nystagmus, as well as conducting tests to help determine the damage to the vestibular system and determine the level of this damage. The study of nystagmus is an important indicator of the vestibular system preservation. Nystagmus invariably occurs when the vestibular-ocular reflex is damaged. Peripheral vestibular disorders are accompanied by horizontal and / or torsion nystagmus, which does not change direction when looking in different directions. Vertical nystagmus indicates a lesion of the vestibular nuclei or cerebellar worm [5].

The diagnostic value of nystagmus research is significantly increased when using Frenzel glasses. These simple devices are equipped with lenses with a refractive power of +16 diopters and a built-in light source. Lenses, on the one hand, prevent eye fixation, which can suppress spontaneous nystagmus caused by damage to the peripheral vestibular system, and on the other – facilitate the visualization of the eyes due to the effect of a magnifying glass.

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The Halmagi test is another way to diagnose damage to the vestibular system. As a result of the test, after turning the head, a corrective saccade appears, which allows you to return the eye to its original position. This saccade is easily detected during research. Positive test Hallmagi indicate damage to the vestibular system. A negative Halmagi test indicates that vertigo is caused by damage to the cerebellum or, rarely, some parts of the large hemispheres of the brain, and not the vestibular system.
The goal of vestibular rehabilitation is to reduce visual disturbances associated with vestibular dysfunction and restore balance, thereby reducing the risk of falls.
Methods of clinical study of balance and determining the risk of falls include the use of special scales that allow quantifying the severity of the patient's existing disorders. The most common and available in everyday practice for screening assessment of stability and risk of falls are the "stand up and walk for a while" test, the test of stability on one leg, the test of walking speed (preferred and maximum).
A total of 46 patients participated in the observational study. Of these, 18 (39%) are men and 28 (61%) are women. The average age was 47 years 95% confidence interval (42.9–51.1) (from 19 to 70 years).

As the cause of vertigo, 44 (95.6%) of the 46 examined patients were diagnosed with vestibular neuritis; one (2.2%) – herpes zoster with a lesion of the cranial ganglion (Ramsey–hunt syndrome), one (2.2%) – labyrinthitis. The observation program lasted 3 months, and all patients were examined 4 times with an interval of 1 month. Vertigo symptoms were objectified using the Dizziness Handicap Inventory (DHI) scale and a 5-point scale for subjective assessment of vertigo severity. SHOGH was developed by G. Jacobson et al. [2] and is widely used to objectify the severity of vertigo in various clinical studies. The scale includes 25 questions with three possible answers to each ("Yes", "no", "sometimes"). The answer to the question " Yes "was rated at 4 points," sometimes " – at 2 points," no " – at 0 points. Based on this, the total score for SHOG can be from 0 (no vertigo) to 100 (very pronounced vertigo). SHOG has 3 sub-scales: functional (assesses to what extent vertigo disrupts the patient's daily activity), emotional (assesses to what extent vertigo disrupts the patient's emotional state), and physical (assesses to what extent head and body movements affect vertigo). In General, this scale allows us to quantify the impact of vestibular diseases on the physical and emotional state of the patient, which is especially important for dynamic monitoring of the course of treatment.
Test "get up and walk for a while": the Subject is asked to get up from a standard chair (seat height 46 cm, armrest height 65 cm), walk 3 m, turn around, go back and sit in the chair again. The test is performed in normal everyday shoes; the patient can use a walking stick or other AIDS that they usually use when moving. Before performing the test, it is recommended to suggest that the patient try to perform what will need to be done for a while. The standard data for the "get up and walk for a while" test are shown in table 1.

Table 1 Normative data for the "get up and walk for a while" test for different age groups.

Age, years	Men with	Women with
40-49	6	7
50–59	7	9
60–69	8	10
70–79	10	11

In General, a time of less than 10 seconds is considered normal. If the test is completed in more than 10 seconds, the risk of falls increases. If the patient spends more than 20 seconds on the test, we can talk about a significant restriction of mobility. Performing the test in more than 30 seconds indicates that there is a dependency on outside help in performing any daily activities.

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Stability test on one leg: the Subject is asked to stand at a distance of one meter from a wall or other stationary object. It is better to perform the test without shoes. The test is performed first with your eyes open and then with your eyes closed. The patient is asked to cross his arms over his chest so that the hands rest on his shoulders, and stand on one leg. It is important that the feet do not touch each other during the study. Measure the time during which the patient can maintain balance. The countdown is stopped if the leg on which the patient is leaning moves on the floor, if the legs touch each other, the raised leg touches the floor, or the patient changes the position of the hands. The second step is to ask the patient to perform this test with their eyes closed. In this case, another reason for stopping the countdown is the opening of the subject's eyes. Standard data for the stability test on one leg for different age groups are shown in table. 2.

Table 2 Normative data for the stability test on one leg for different age groups

Age, years	With open eyes, with	With closed eyes, with
40-49	29,7 ± 1,3	24,2 ± 8,4
50-59	29,4 ± 2,9	21,0 ± 9,5
60-69	22,5 ± 8,6	10,2 ± 8,6
70-79	14,2 ± 9,3	4,3 ± 3,0

Thus, normally a person over the age of 60 years should be able to stand on one leg with his eyes closed for an average of at least 5 seconds. At the same time, there should be no significant difference between stability on the right and left leg.

Apparently, the stability test on one leg has insufficient reproducibility [2] and is unlikely to be applicable for the diagnosis of postural disorders. However, it can be used to monitor the effectiveness of rehabilitation [6].

Walking speed test (preferred and maximum): the Subject is asked to walk a distance of 6 m first at the normal speed and then at the maximum possible speed. Standard data for the walking speed test are given in table 3

Table 3 Normative data for the test of walking speed – preferred and maximum, m / s

Age, years	Preferred speed		Maximum speed	
	men	Women	Men	Women
20-29	1,09	1,06	1,95	1,96
30-39	1,27	1,16	1,83	1,65
40-49	1,13	1,08	1,74	1,57
50-59	0,94	1,09	1,17	1,49
60-69	0,95	0,87	1,21	1,27
70-79	0,94	0,85	1,35	1,19

Selection of vestibular gymnastics exercises: Despite the wide variety of exercises for vestibular rehabilitation, gymnastics usually includes two groups of exercises: eye stabilization and balance training [4,7]. The most common exercise for eye stabilization is that the patient is asked to fix the gaze on an object located at arm's length, and turn the head from side to side in the horizontal and vertical planes.

The exercise is performed for 30-60 2-3 times a day. The criterion for correctly selected speed of head movements is the ability to clearly see the object in the outstretched hand.

As you train, the exercise becomes more complex: if the patient first performs this exercise sitting, then at the next stage – standing, then-standing in the "legs together" position, then-standing in a tandem position, then-standing on a soft Mat, an inclined surface, and so on. In addition, the gaze can be fixed not only on closely located objects, but also on objects located, for example, at the other end of the room.

Immediately after the diagnosis, patients were selected exercises for vestibular gymnastics.

The results of the observational program indicate that in most cases (71.7%), the best therapeutic effect in patients with acute non-progressive peripheral vestibular disease occurred after 2 months of treatment. At the same time, after 3 months of treatment, the patients ' condition continued to improve somewhat, but these differences were not statistically significant.

Improvement in the condition of patients who took part in the observational study was noted for all under the SHOG scales. This indicates that vestibular rehabilitation in combination with medication improves the daily activity of patients with damage to the peripheral part of the vestibular analyzer, reduces the dependence of vertigo on movements in General and the head in particular, which is very characteristic of vestibular dysfunctions, and also improves the emotional state of patients.

Thus, vestibular rehabilitation is an important component of the treatment of patients suffering from various vestibular diseases. Selection of vestibular gymnastics is relatively simple, and monitoring changes in the condition of patients and objectification of indicators that reflect the severity of vestibular disorders

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